

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 880 308 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
03.09.2003 Bulletin 2003/36

(51) Int Cl.7: **H05B 37/03**

(21) Application number: **98201545.5**

(22) Date of filing: **08.05.1998**

(54) **Device for monitoring and managing lighting systems**

Gerät zur Steuerung und Überwachung von Beleuchtungssystemen

Appareil de commande et de surveillance de systèmes de d'éclairage

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IT LI NL PT SE
Designated Extension States:
RO

(30) Priority: **22.05.1997 IT RE970033**

(43) Date of publication of application:
25.11.1998 Bulletin 1998/48

(73) Proprietor: **Elettronica Reverberi S.r.l.**
42035 Castelnovo ne'Monti (RE) (IT)

(72) Inventor: **Elettronica Reverberi S.r.l.**
42035 Castelnovo ne'Monti (RE) (IT)

(74) Representative: **Dini, Roberto, Dr. Ing. et al**
Via Castagnole, 59
10060 None (Torino) (IT)

(56) References cited:
EP-A- 0 746 183 WO-A-92/16086
GB-A- 2 284 952

EP 0 880 308 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] This invention relates to the monitoring of electric lighting networks, and the management thereof.

[0002] Electric lighting networks and comparable systems are characterised by very wide-ranging and branched electricity distribution providing energy to each individual lamp or to each individual user item within such systems.

[0003] It is therefore very important to be able to monitor both the state of each individual lamp or generic peripheral user item, and the state of the entire network, in order to be able to program maintenance and prevent local faults or abnormalities progressing into irreparable damage to the entire network.

[0004] The state of the art currently comprises monitoring systems by which certain parameters signifying proper operation of the peripheral user items are obtained locally at each user item, and fed by a carrier wave system, via the cables powering the user items, to a central microprocessor programmed to detect discordances in the parameters and convert them into signals indicating the type of fault or abnormality of said peripheral units.

[0005] It is known for example from European Patent Application EP 0637195 to assume as an abnormality-signifying parameter the phase-displacement between the voltage and current fed to the user item concerned, and to statistically deduce the nature of the fault or abnormality from the measured phase-displacement.

[0006] However, beyond the limits deriving from attributing the nature of the fault to the statistical change in an abstract parameter, namely the phase difference between the current and the voltage, the known systems, and in particular the aforescribed system, do not enable other interesting situations, such as current dispersions or illicit current withdrawal, to be identified.

[0007] A further limitation of known systems is that they can be activated only when the user items are in operation.

[0008] The object of this invention is to remedy the deficiencies of known systems by means of a reliable, low-cost monitoring system of simple operation.

[0009] This object is attained according to the invention by the systems characterised in the claims.

[0010] The operational and constructional characteristics of the invention will be more apparent from the detailed description of a possible application of the invention to a public lighting network, given hereinafter by way of non-limiting example with reference to the accompanying drawings.

[0011] Figure 1 shows the scheme of an electric lighting upright forming part of the lighting system monitored by the invention.

[0012] Figure 2 shows the circuit block scheme of the transmission unit associated with the upright.

[0013] Figure 3 shows the circuit block diagram of the central control unit.

[0014] The figures show an upright 100_i carrying at its end a lamp 10_i , where i lies between 1 and n , for a lighting network comprising n uprights.

[0015] The lamp 10_i can be either of the mercury vapour type or of the sodium vapour type, in this latter case it being associated with a usual reactor 12_i and a suitable ignition system, not shown in the figure.

[0016] The power circuit of each individual lamp 10_i can also comprise a rephasing capacitor 13_i .

[0017] Within the support upright of each lamp, according to the invention, there is located a transmission unit 2_i , the block scheme of which is shown in Figure 2.

[0018] The transmission unit 2_i comprises a microprocessor 25_i , which in the illustrated example is a Texas Instruments microprocessor type TMS370C6C2 controlling a carrier-wave transmitter-receiver 26_i , which in the illustrated example is a National transceiver type LM1893.

[0019] The microprocessor 25_i receives data regarding the line and lamp voltage and current, and regarding the power factor associated with the lamp 10_i , these data being measured by known devices positioned within the block 23_i connected to the lamp feed branch 41_i .

[0020] The microprocessor 25_i also controls the electromechanical or static relay represented by the block 24_i , which switches the lamp 10_i in or out.

[0021] The transmitter-receiver represented by the block 26_i sends/receives signals to/from the feed line via the module 21_i .

[0022] The block 22_i represents a carrier-wave blocking filter, the function of which is evident.

[0023] Via the branch 41_i and the line 4 the carrier signals reach the central unit 3, the block scheme of which is shown in Figure 3.

[0024] The central unit 3 comprises a central microprocessor 34 , which in the illustrated example is an Intel microprocessor type 80C32, this being able to analyze and compare the data originating from the microprocessors 25_i .

[0025] The microprocessor 34 receives data from the carrier-wave transmitter-receiver 33 via the module 32 , which is similar to the module 21_i .

[0026] The system operates as follows.

[0027] The central unit 3 firstly feeds the entire lighting network, with the electromechanical or static relays 24_i initially open.

[0028] In this situation the voltage present upstream of each electromechanical or static relay 24_i in each upright 100_i is locally measured by the devices contained in the blocks 23_i .

[0029] Comparing the measured voltage with the theoretical or design voltage initially contained in the microprocessor 34 , less load losses, enables operating abnormalities to be detected, such as line discontinuities, dispersions along the line, or unauthorized current withdrawals, also identifying the point along the line where the abnormalities occur.

[0030] If the microprocessor 34 of the central unit en-

counters no abnormality, it feeds a signal to all the local microprocessors 25_i, which close the respective electromechanical or static relays 24_i, to cause the lamps to light simultaneously.

[0031] It is apparent that this facility for line monitoring with the lamps unlit enables this monitoring to be programmed for very short intervals of several times a day, and hence the entire lighting network to be maintained constantly under control, to provide for the necessary repair and maintenance in good time before the moment for evening lighting of the lamps.

[0032] During the period in which the lamps are alight, the central microprocessor 34 receives data regarding the current absorbed by each lamp and the power factor, from each peripheral microprocessor 25_i.

[0033] These data are compared with the data considered normal, to provide all the information concerning the regular operation of the lamp and its state of wear.

[0034] In the case of discrepancy the local microprocessor 25_i can temporarily or definitively interrupt power to each individual lamp 10_i, to prevent its maloperation causing damage to the entire network.

Claims

1. A device for monitoring and managing systems having a multiplicity of identical network user items (1i), such as public lighting systems, comprising at each user item a local transmission unit (2i) composed of an element for measuring the feed parameters (23i) of the user item, a local microprocessor (25i) for processing said parameters, a transceiver (26i) coupled to said microprocessor and the feed line (41i) of the user item via a carrier-wave module (21i) and a carrier-wave blocking filter (22i), and a central processor (34) which receives signals from each local microprocessor (25i) via the feed line, processes them and transmits signals to each local microprocessor (25i), **characterised in that** the measuring element (23i) for the feed parameters of the user item (1i) is a device for measuring the line voltage and current intensity.
2. A device as claimed in claim 1, **characterised in that** the measuring element (23i) for the user item (1i) feed parameters is a device for measuring the current intensity and the voltage at the user item.
3. A device as claimed in claim 1, **characterised in that** each user item (1i) is connected to the feed line by an electromechanical or static relay (24i) controlled by the respective local microprocessor.
4. A device as claimed in claim 3, **characterised in that** the electromechanical or static relay (24i) is positioned downstream of the voltage measuring device (23i), to also enable the voltage to be measured

when the user item is disconnected.

5. A device as claimed in claim 1 **characterised in that** said monitoring and managing system monitors with the user items (1i) unlit.

Patentansprüche

1. Gerät zur Prüfung und Betrieb von Systemen mit einer Vielfalt ähnlicher Leitungsverbraucher (1i), wie z.B. öffentliche Beleuchtungseinrichtungen, das Gerät enthaltend bei jedem Verbraucher eine örtliche Übertragungseinheit (2i) bestehend aus einem Messbauteil für die Versorgungsparameter (23i) des Verbrauchers, ein örtliches Mikroprozessor (25i) zur Verarbeitung obiger Parameter, einen mit obigem Mikroprozessor und der Verbraucher-Versorgungsleitung (41i) durch ein Trägerwellenmodul (21i) und einen Trägerwellensperrfilter (22i) verbundenen Sende-Empfänger (26i); einen Hauptprozessor (34), der Signale aus jedem örtlichen Mikroprozessor (25i) über die Versorgungsleitung erhält, verarbeitet und Signale an jeden örtlichen Mikroprozessor (25i) überträgt, **dadurch gekennzeichnet, dass** das Messbauteil (23i) für die Versorgungsparameter des Verbrauchers (1i) ein Gerät zum Messen der Leitungsspannung und der Stromstärke ist.
2. Gerät nach Anspruch 1, **dadurch gekennzeichnet, dass** das Messbauteil (23i) für die Versorgungsparameter des Verbrauchers (1i) ein Gerät zum Messen der Stromstärke und Spannung an der Verbraucherherstelle ist.
3. Gerät nach Anspruch 1, **dadurch gekennzeichnet, dass** jedes Verbraucher (1i) mit der Leitung durch ein elektromechanisches bzw. statisches Relais (24i) verbunden ist, das durch den entsprechenden örtlichen Mikroprozessor gesteuert ist.
4. Gerät nach Anspruch 3, **dadurch gekennzeichnet, dass** sich das elektromechanische bzw. statische Relais (24i) abwärts des Spannungsmessgeräts (23i) befindet, damit auch bei ausgeschaltetem Verbraucher die Spannung gemessen werden kann.
5. Gerät nach Anspruch 1, **dadurch gekennzeichnet, dass** das Prüfungs- und Betriebssystem überwacht, während die Verbraucher (1i) ausgeschaltet sind.

Revendications

1. Dispositif de contrôle et de gestion de systèmes

possédant une pluralité d'utilisations identiques (1i) sur le réseau, telles que des installations d'éclairage public, comprenant à chaque utilisation une unité locale d'émission (2i) constituée d'un élément de mesure (23i) des paramètres d'alimentation de l'utilisation, un microprocesseur local (25i) afin de traiter lesdits paramètres, un émetteur-récepteur (26i) couplé audit processeur et au réseau d'alimentation (41i) de l'utilisation par un module à onde porteuse (21i) et un filtre d'arrêt d'onde porteuse (22i), et un processeur central (34) recevant des signaux de chaque microprocesseur local (25i) par l'intermédiaire du réseau d'alimentation, les traite et transmet des signaux à chaque microprocesseur local (25i), **caractérisé en ce que** l'élément de mesure (23i) des paramètres d'alimentation de l'utilisation (1i) est un dispositif de mesure de la tension et de l'intensité du courant du réseau.

2. Dispositif selon la revendication 1, **caractérisé en ce que** l'élément de mesure (23i) des paramètres d'alimentation des utilisations (1i) est un dispositif de mesure de l'intensité du courant et de la tension de l'utilisation.

3. Dispositif selon la revendication 1, **caractérisé en ce que** chaque utilisation (1i) est reliée au réseau par un relais électromécanique ou statique (24i) commandé par le microprocesseur local respectif.

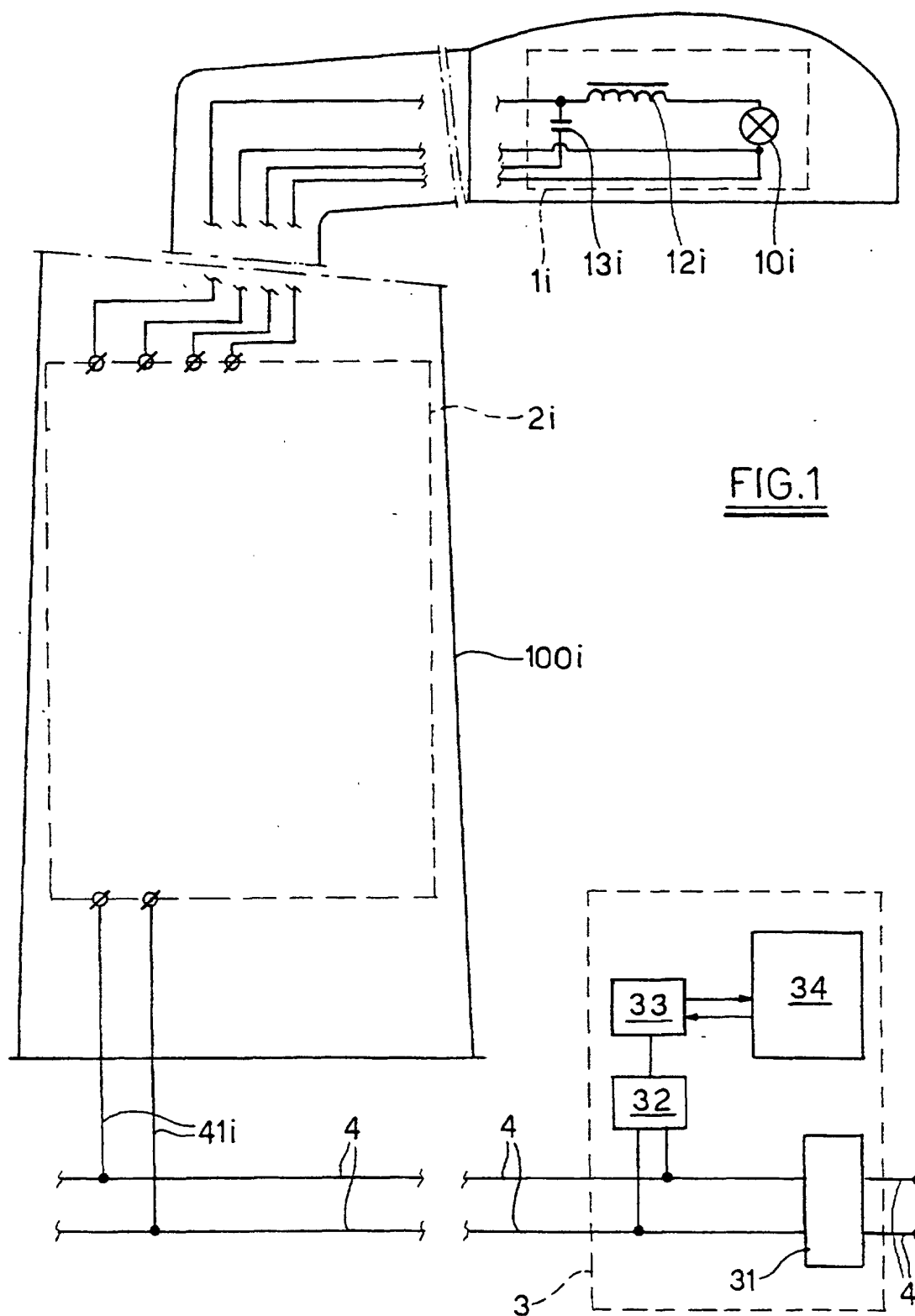
4. Dispositif selon la revendication 3, **caractérisé en ce que** le relais électromécanique ou statique (24i) est disposé en aval du dispositif de mesure de tension (23i), pour permettre également une mesure de la tension lorsque l'utilisation est déconnectée.

5. Dispositif selon la revendication 1, **caractérisé en ce que** ledit système de contrôle et de gestion effectue le contrôle avec les utilisations (1i) non éclairées.

45

50

55



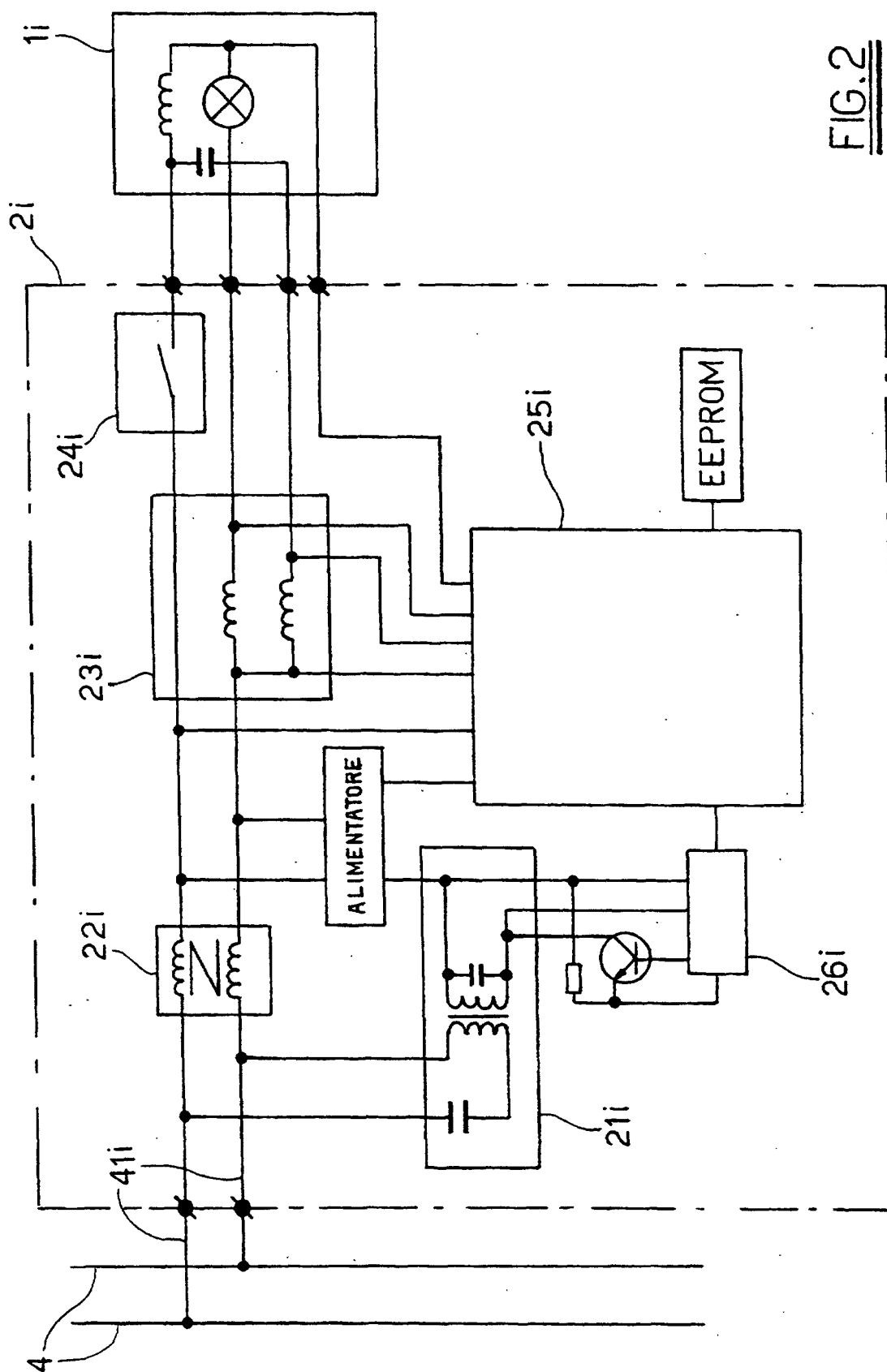


FIG. 2

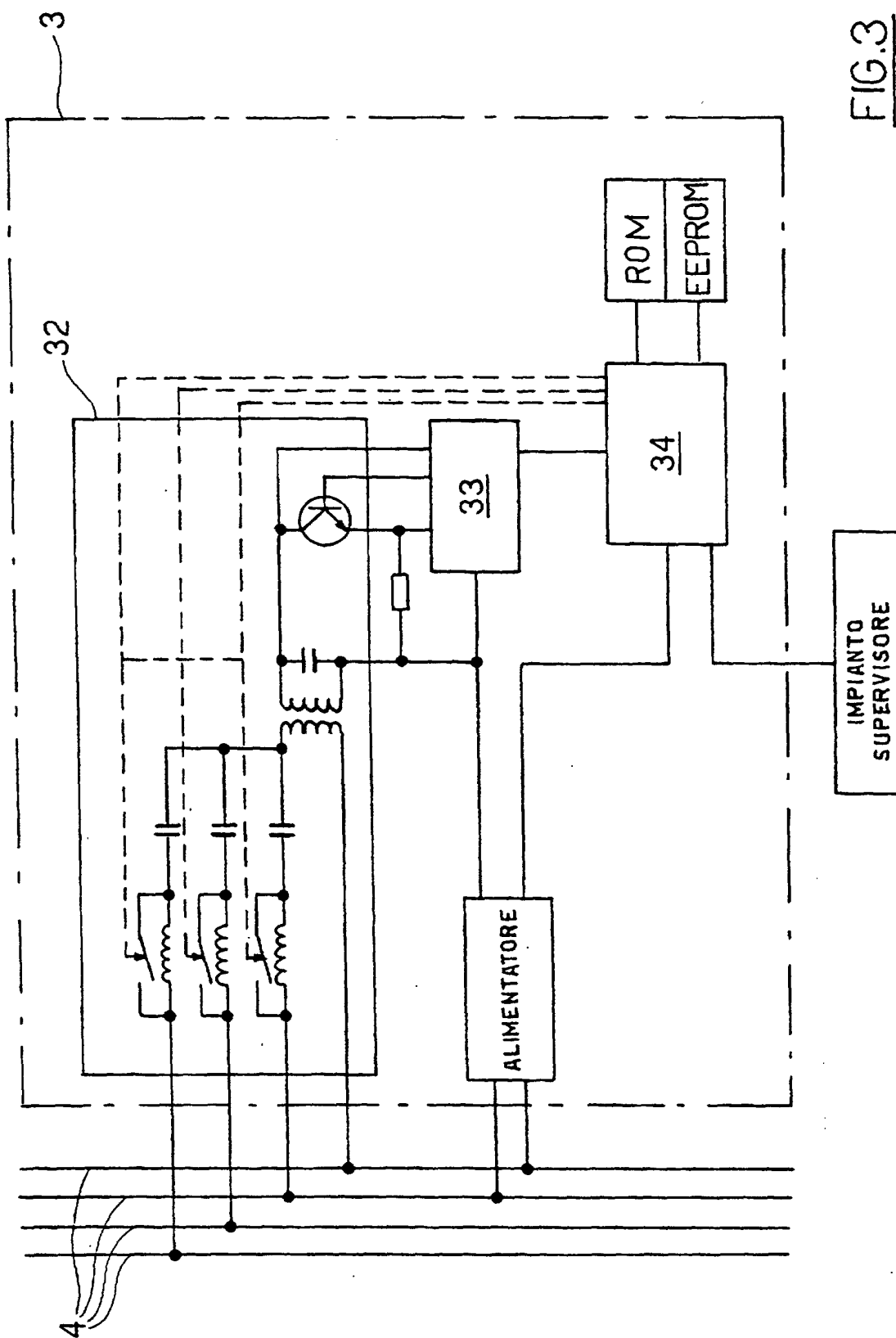


FIG. 3